## TCS

## 3A NODE 1 SHELL HEATER FAILURE

Advisory:
NODE1 Htr[X] B(A) Failed

User Notification

PCS NODE 1: TCS
NODE1: TCS
sel NODE1 Htr[X]B(A)
Health Stat - Faild

PCS NODE1: TCS
NODE1: TCS
Attention symbol appears next to NODE1 Htr[X]B(A)

**Nominal Stage Config:**
nav NODE 1: TCS
NODE1: TCS
NODE1 Htr [X]B
Availbty - Ena Opr

NODE1 Htr [X]A
Availbty - Ena BU

RPCM N1RS2A
RPC 1, 2, 3, 4, 12, 13, 14, 15, 16
Close Cmd - Enable

RPCM N1RS1A
RPC 1, 2, 3, 4, 12, 13, 14, 15, 16
Close Cmd - Inhibit

**Nominal Assy Config**
During Pre-Ingress Warmup, Ingress and Post-Egress Dryout, the heater availability will be variable (limited by power and zone temperature priorities). This procedure accounts for these periods as well as the nominal stage configuration.

1 Check Heater Failure Flags.

PCS NODE 1: TCS
NODE 1: TCS
- sel NODE1 Htr[X]B(A)
- Determine condition via failure flags:

| | |
|---|---|
| Availbty - Inh and Cmd Stat - On | 82 |
| Hi Lim Violatn - True | 6 |
| Low Lim Violatn - True | 45 |
| No Val Temp Snsrs - True | 2 |
| Temp Snsrs Disagree - True | 79 |
| Temp Snsr Stat1(2) - Faild | 5 |
| RPC Position - Op and Cmd Stat - On | 59 |
| RPC Position - Cl and Cmd Stat - Off | 20 |
| RPC Position - Cl and Availbty - Inh | 12 |
| RPC - Trip | 55 |

2 All B(A) Temp Sensors failed?
No → 87
Yes → 3

3 Possible loss of MDM Card N1-2 A03 (N1-1 A03).

4
- Perform MDM IO CARD FAILURE, all (SODF: C&DH), then
- √**MCC-H** for heater reconfiguration.

1 → 5 Temp sensor failure. No action required. (1)

1 → 6 Temp(Temp 1 or Temp 2) > Temp Snsr(Temp Snsr 1 or Temp Snsr 2) Failure Upper Limit?
No → 7 Transient failure. → 8
- Continue nominal operations.

Yes → 9
- sel Nod1 Htrs 1-6 (7-9) Availability
- sel Htr[X]B(A) Htr Power

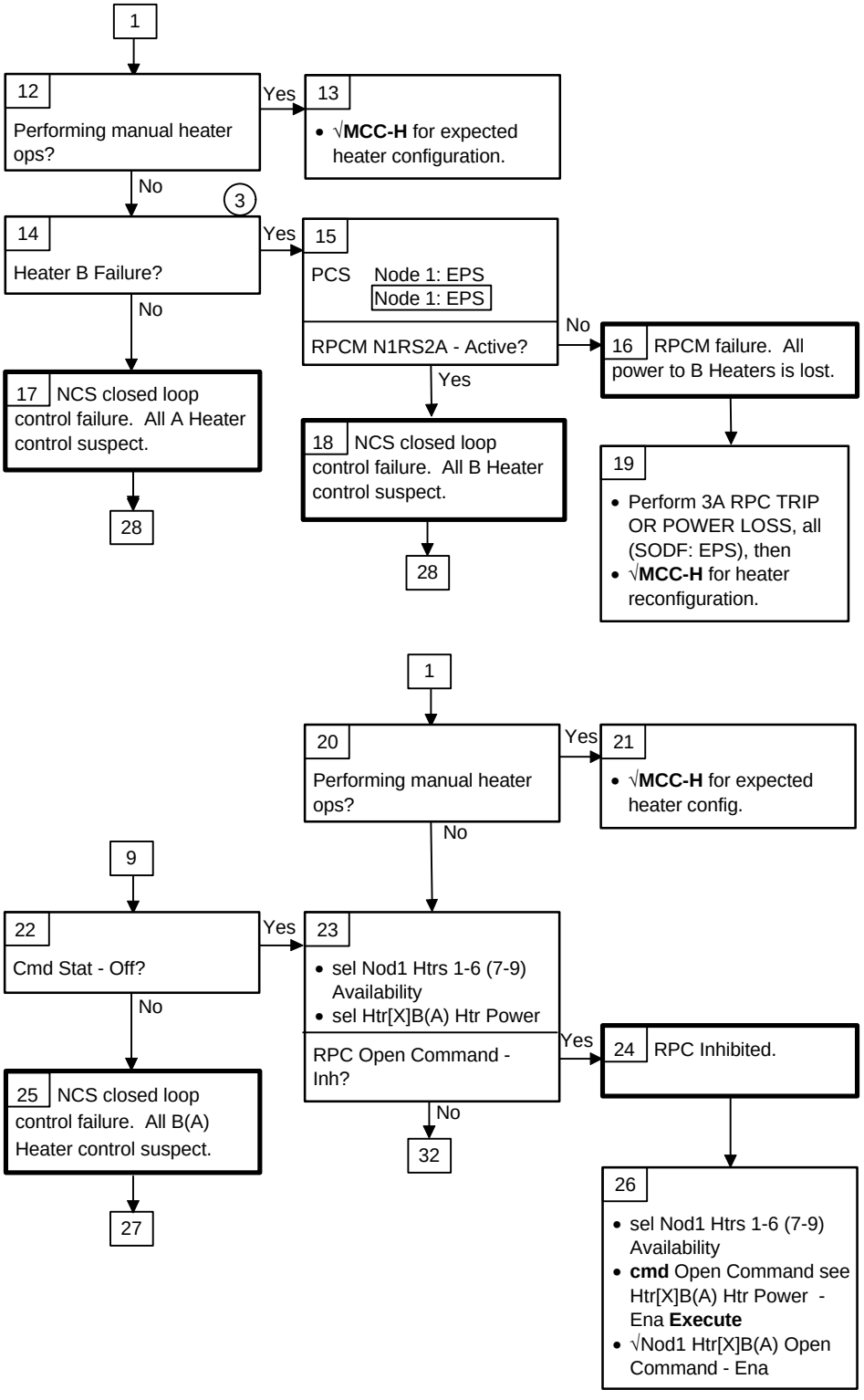
RPC Position - Op?
Yes → 10 Possible transient hot thermal environment. (2)
No → 22

11
- √**MCC-H** for further action.

(1) NCS software will no longer consider this temperature sensor valid. Software will automatically deselect sensor and use the redundant sensor for closed loop control.

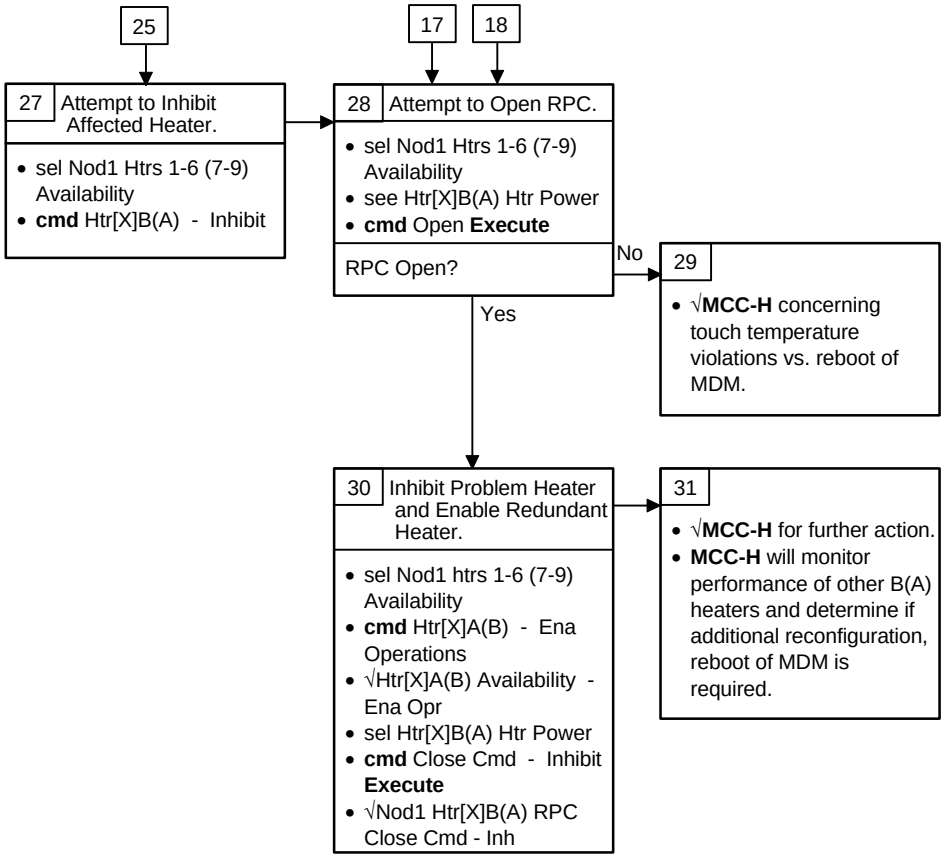
(2) Failure Upper Limit band may be set too small. **MCC-H** may uplink a change to Failure Upper Limit.

# 3A NODE 1 SHELL HEATER FAILURE (Cont)

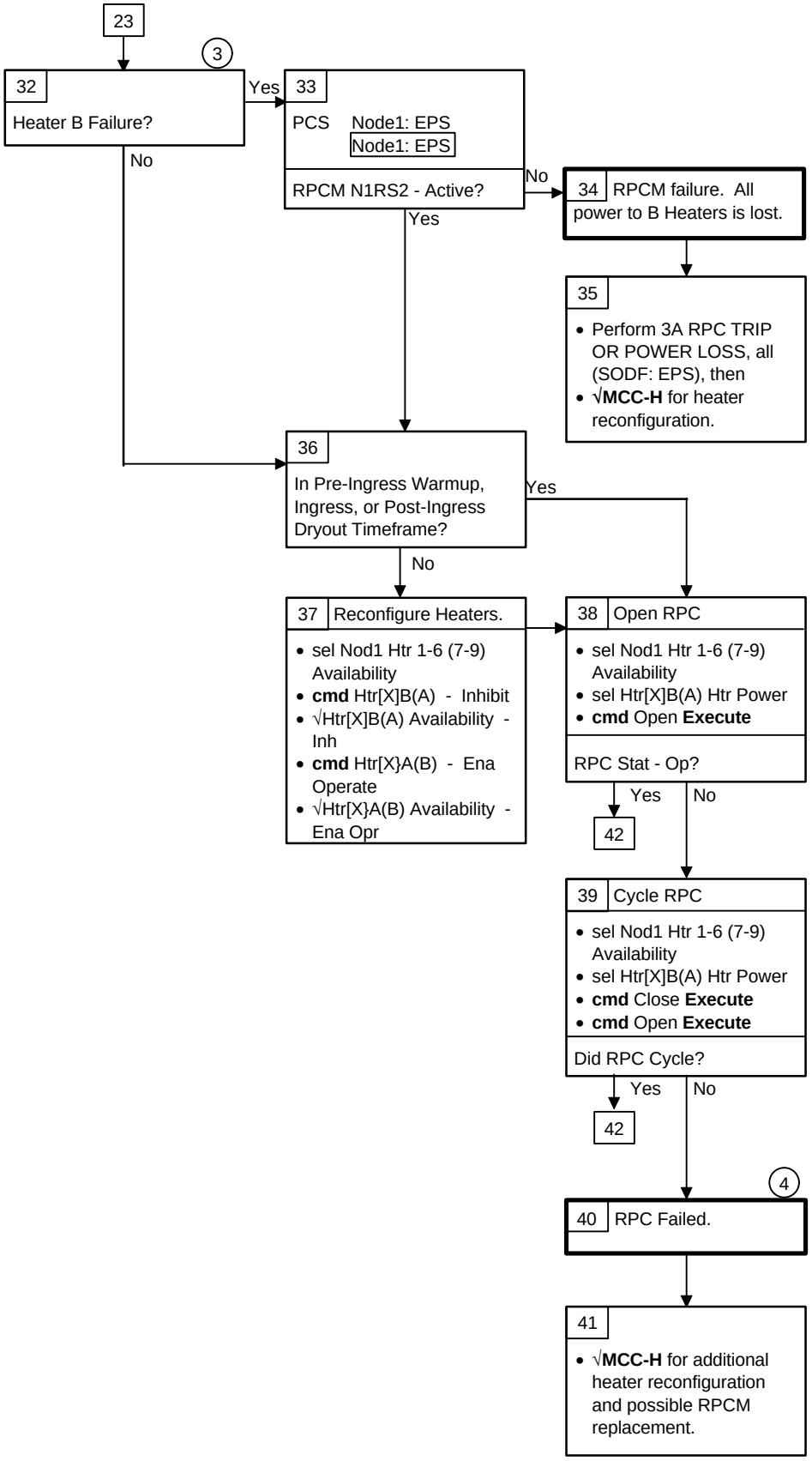



(3) The A Heaters are connected to the same RPCM as MDM N1-1. The MDM Failure malfunction will be worked in that case. The B Heaters are not connected to the same RPCM as MDM N1-2; therefore, it is possible that the heater configuration problem could be detected before the RPCM failure.

# 3A NODE 1 SHELL HEATER FAILURE (Cont)



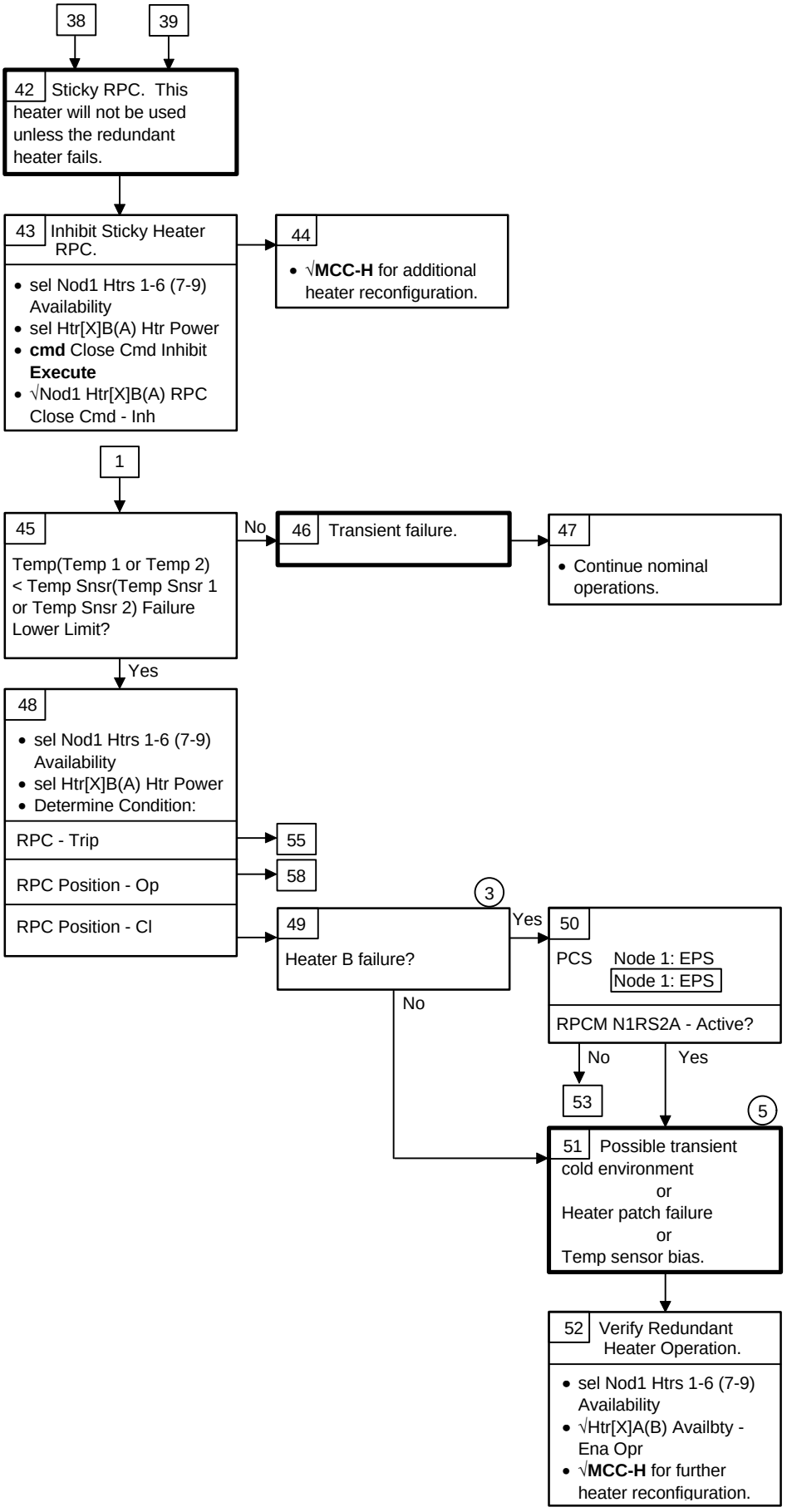
# 3A NODE 1 SHELL HEATER FAILURE (Cont)




(3) The A Heaters are connected to the same RPCM as MDM N1-1. The MDM Failure malfunction will be worked in that case. The B Heaters are not connected to the same RPCM as MDM N1-2, therefore it is possible that the heater configuration problem could be detected before the RPCM failure.

(4) **MCC-H** will evaluate the possibility of touch temperature violations and the consequences of leaving the heater on

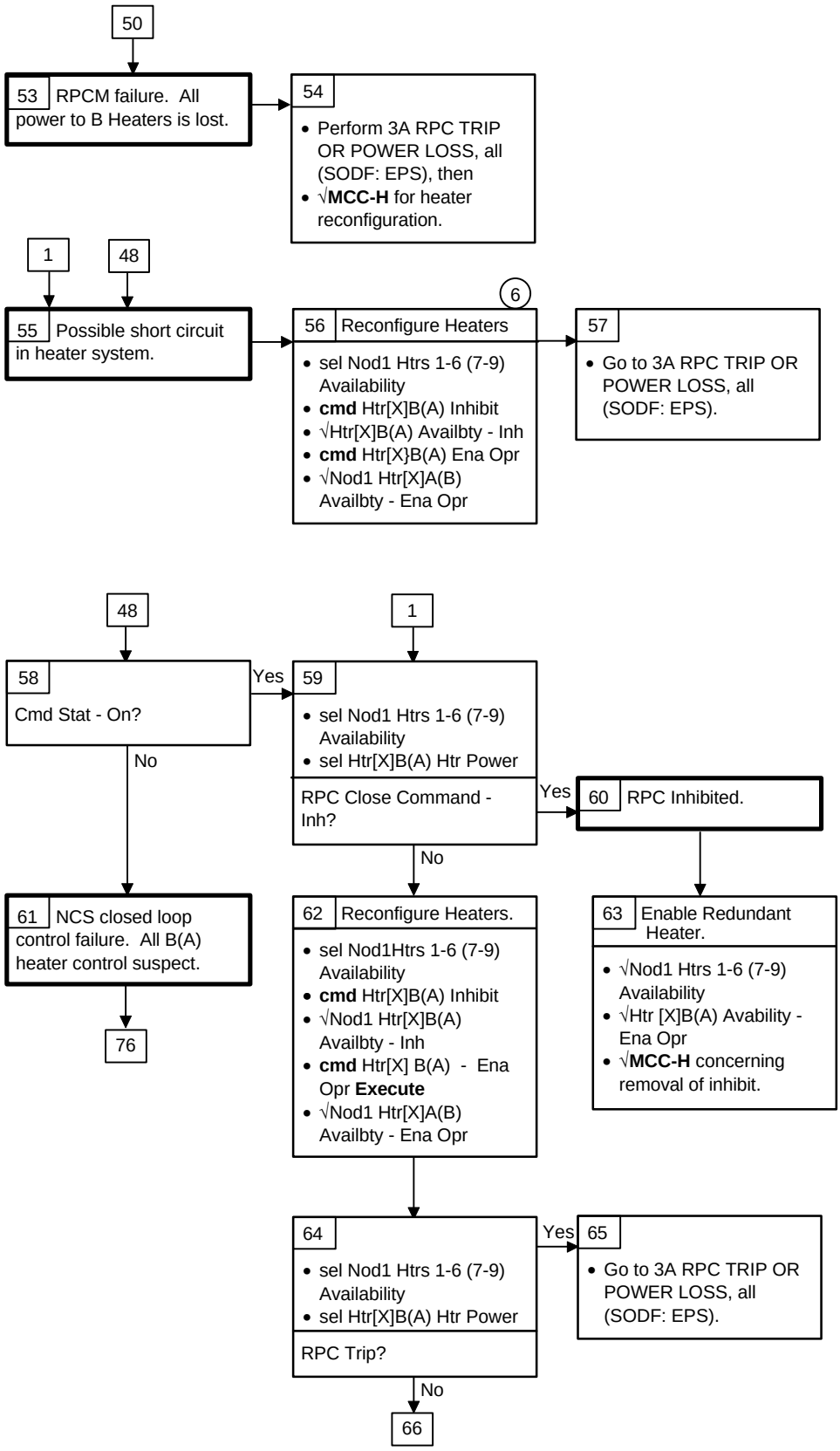
# 3A NODE 1 SHELL HEATER FAILURE (Cont)




(3) The A Heaters are connected to the same RPCM as MDM N1-1. The MDM failure malfunction will be worked in that case. The B Heaters are not connected to the same RPCM as MDM N1-2, therefore it is possible that the heater configuration problem could be detected before the RPCM failure.

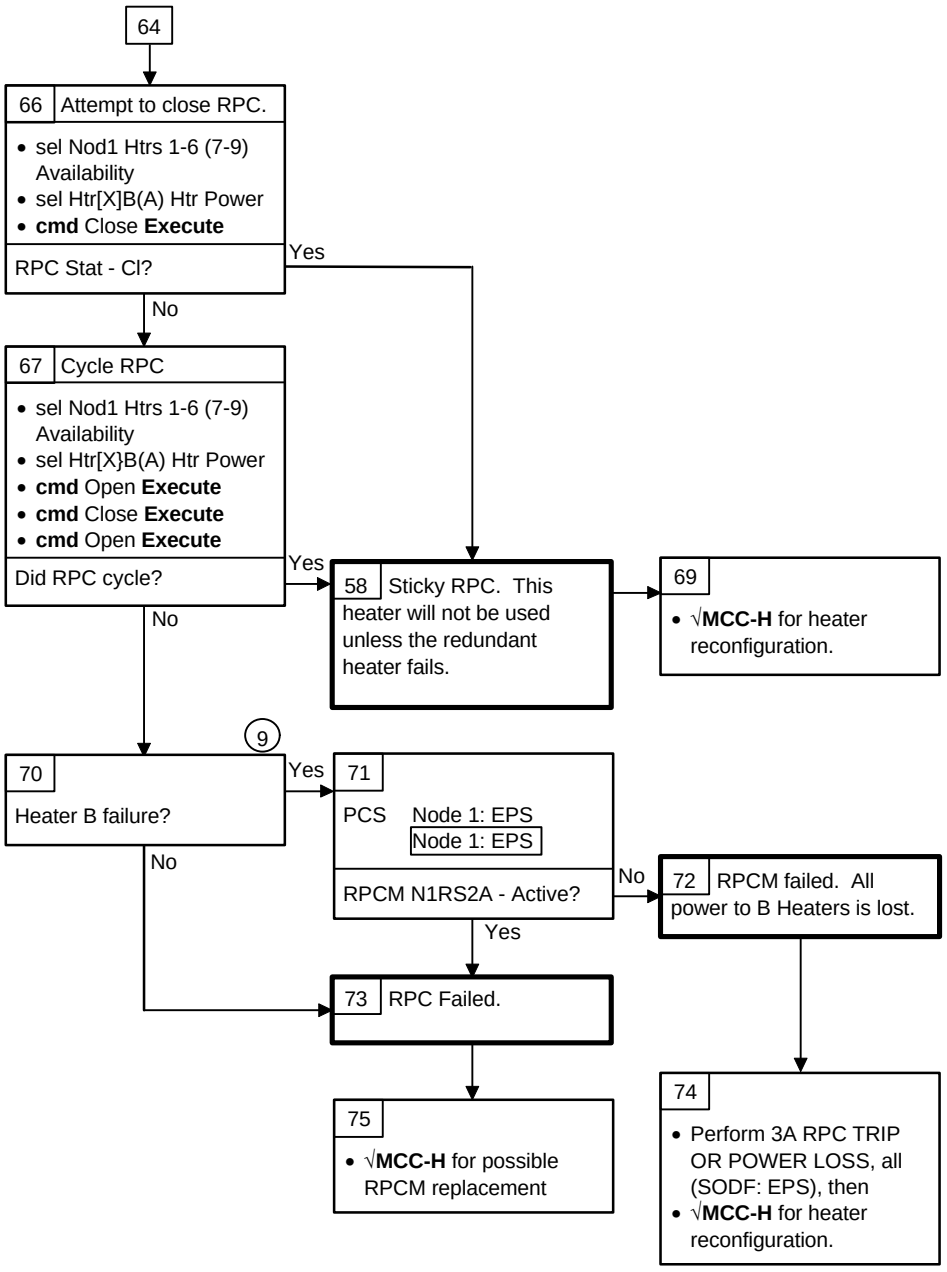
(5) A transient cold environment could require both B and A Heaters to keep temperatures within limits. A heater pad degonding failure or open circuit failure could also be the culprit in this case.

# 3A NODE 1 SHELL HEATER FAILURE (Cont)



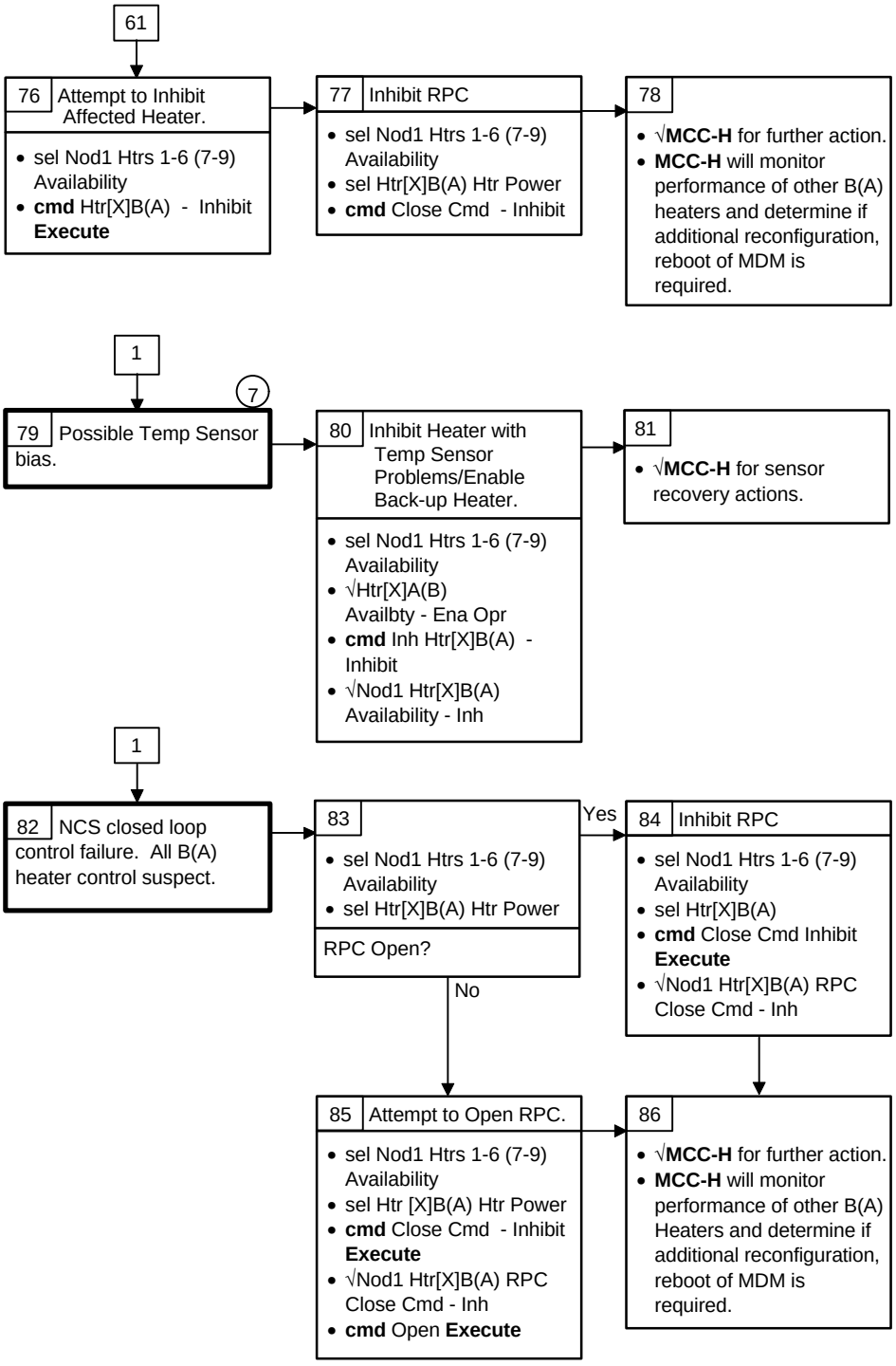

(6) Since the RPC has tripped once, it will not be used again unless necessary.

# 3A NODE 1 SHELL HEATER FAILURE (Cont)



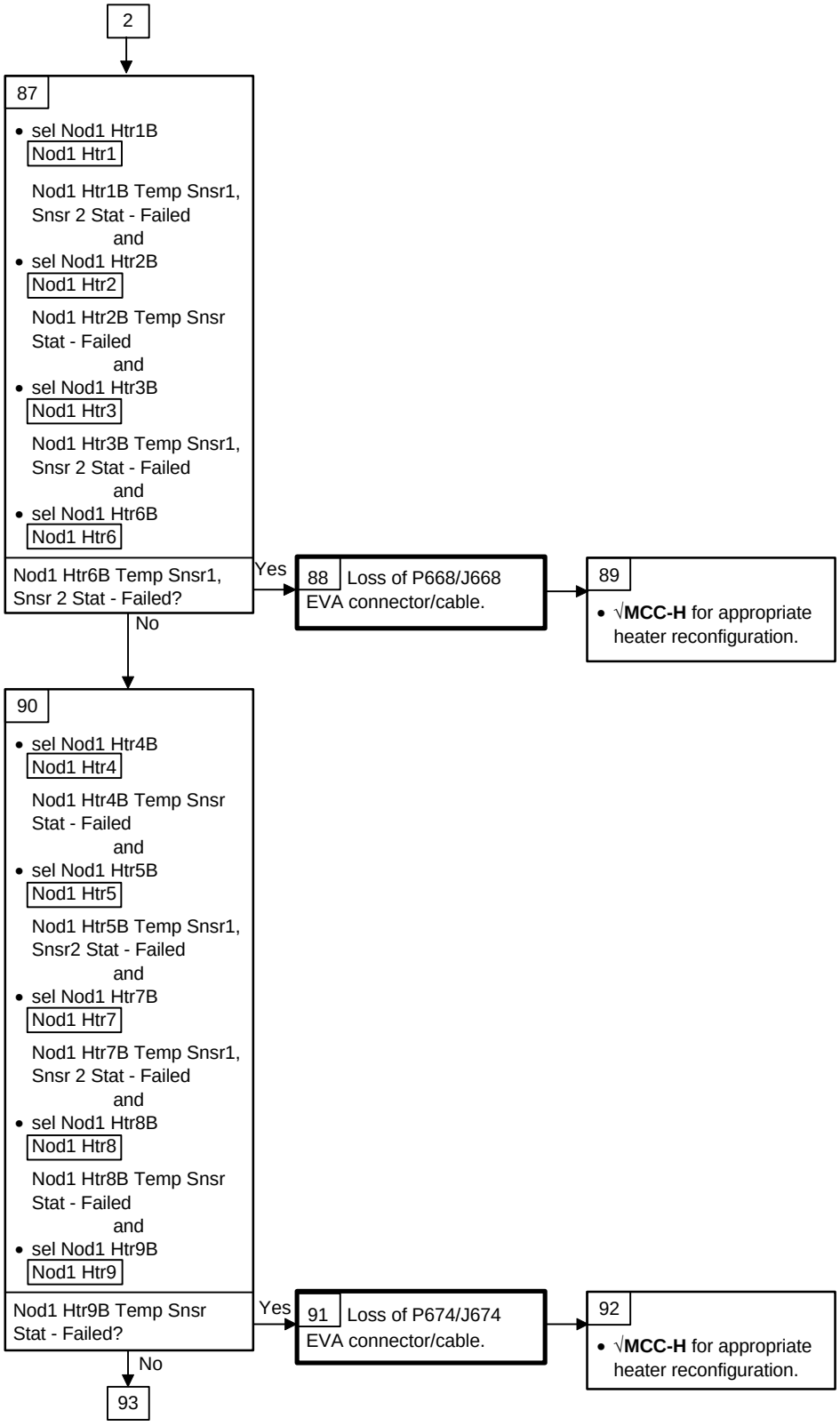

(3) The A Heaters are connected to the same RPCM as MDM N1-1. The MDM failure malfunction will be worked in that case. The B Heaters are not connected to the same RPCM as MDM N1-2, therefore it is possible that the heater configuration problem could be detected before the RPCM failure.

# 3A NODE 1 SHELL HEATER FAILURE (Cont)

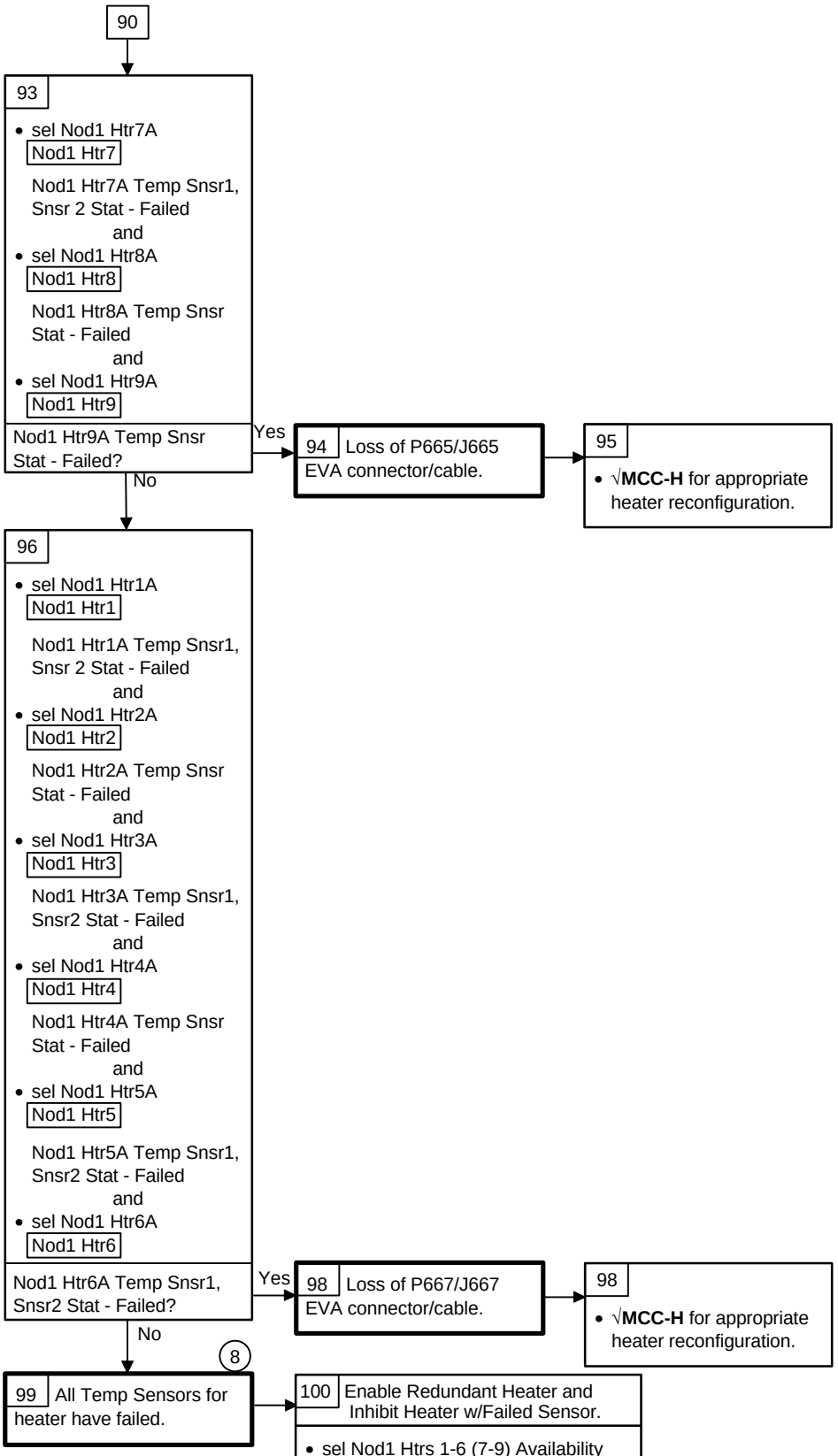



(7) Temperature of one sensor is less than its lower setpoint, temperature of the redundant sensor is greater than its upper setpoint. Software will command the heater

# 3A NODE 1 SHELL HEATER FAILURE (Cont)



# 3A NODE 1 SHELL HEATER FAILURE (Cont)




(8) Temp sensor(s) have failed range check. Temp reading is either higher than +400°C or lower than -350°C. Software will command heater off (default state).